5.0 Falls City, Texas, Disposal Site

5.1 Compliance Summary

The Falls City, Texas, Disposal Site, inspected on January 31, 2007, was in excellent condition. Deep-rooted woody vegetation continues to encroach on the top and side slopes of the disposal cell, requiring control. The turf on the disposal cell top and the remainder of the site appears to have recovered from drought conditions. Groundwater monitoring was performed; historical trends continue. The revised LTSP was submitted to NRC; concurrence is pending. No maintenance needs or cause for a follow-up or contingency inspection were identified.

5.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Falls City, Texas, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Falls City, Texas, Disposal Site* (DOE/AL/62350–187, Rev. 3, U.S. Department of Energy [DOE], Albuquerque Operations Office, July 1997) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 5–1. Groundwater monitoring is conducted in accordance with both the LTSP and the *Ground Water Compliance Action Plan* (GCAP) (DOE, Grand Junction, Colorado, March 1998).

Table 5–1. License Requirements for the Falls City, Texas, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 6.0 and 10.0	Section 5.3.1
Follow-up or Contingency Inspections	Section 7.0	Section 5.3.2
Routine Maintenance and Repairs	Section 8.0	Section 5.3.3
Groundwater Monitoring	Section 5.0 (and the GCAP)	Section 5.3.4
Corrective Action	Sections 5.0 and 9.0	Section 5.3.5

Institutional Controls—Institutional controls at the disposal site, as defined by DOE Order 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no trespassing signs placed along the property boundary, and locked gates in the perimeter fence.

The 231-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) in 1998. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site.

Inspectors found no evidence that these institutional controls were ineffective or violated.

5.3 Compliance Review

5.3.1 Annual Inspection and Report

The site, located east of Falls City, Texas, was inspected on January 31, 2007. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 5–1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

5.3.1.1 Specific Site Surveillance Features

5A **Access Road, Entrance Gate, Fence, and Signs**—The perimeter signs and the entrance sign were in excellent condition and were numbered after the 2007 inspection. The perimeter fence and two gates were in good condition.

Site Markers and Monuments—The two site markers, SMK–1 at the entrance gate and SMK–2 on top of the disposal cell, are in excellent condition.

Three survey monuments and two boundary monuments situated at the corners of the site are undisturbed and in excellent condition. Vegetation was removed from around survey monument SM–2 (PL–1).

Monitor Wells—There are 7 monitor wells in the cell performance network, and 5 wells in the groundwater compliance network. Monitor wells in the groundwater-monitoring network were inspected when they were sampled in October 2006 and April 2007. All wells were secure and in excellent condition.

5.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three areas referred to as transects: (1) the top and side slopes of the disposal cell; (2) the site perimeter; and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

Top and Side Slopes of the Disposal Cell—The top of the disposal cell is covered with well-established grass and in good condition. Occasional mesquite seedlings, a deep-rooted tree, are scattered across the cell top (PL–2). A local rancher cuts hay each year from the disposal site, including the top of the cell (PL–3). The grass on the cell top had been cut short to control the risk of fire. Vegetation is dense and no sparse or barren areas were noted. There are no deep-rooted plants remaining on top of the disposal cell once the grass is cut.

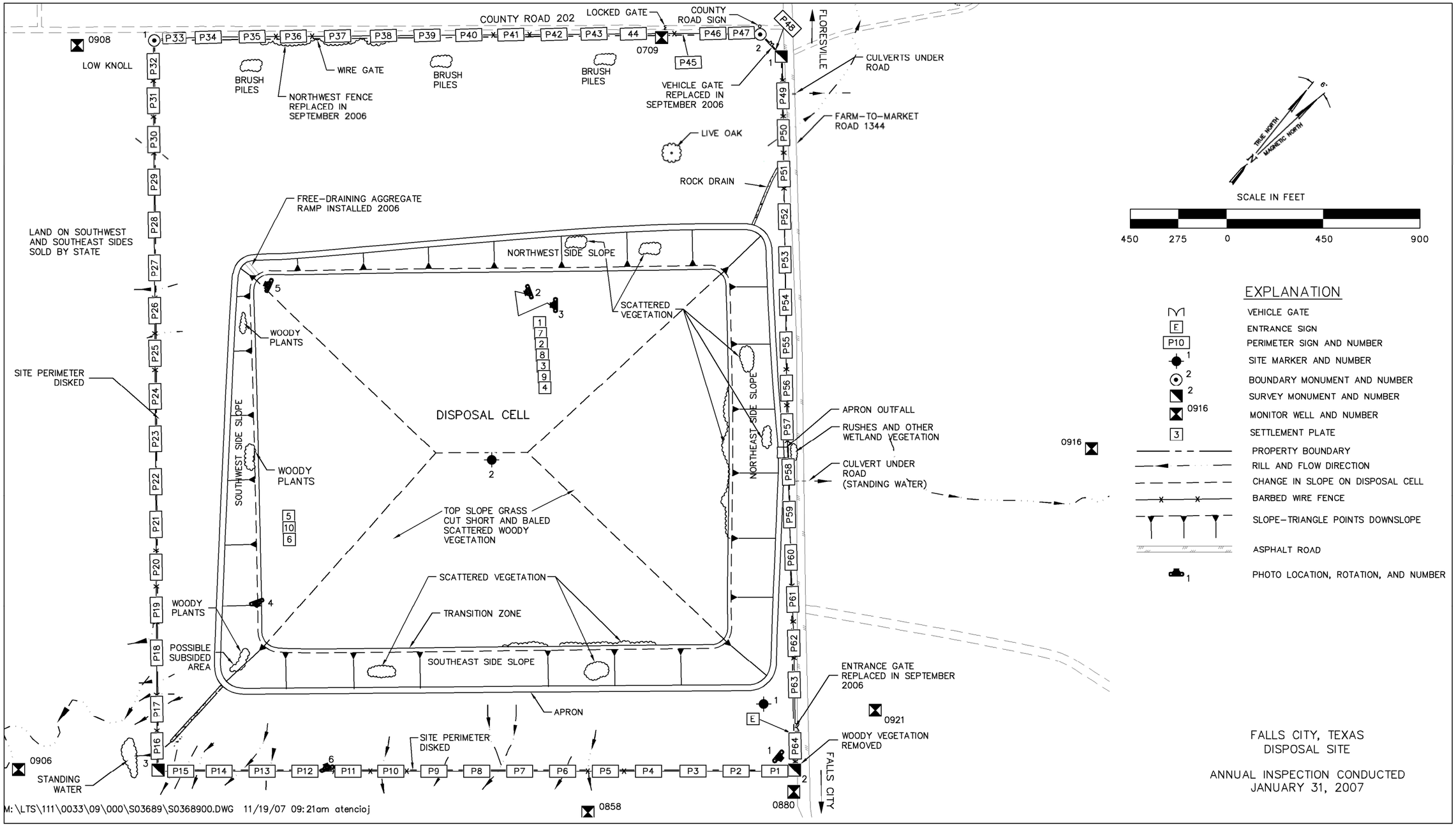

Figure 5–1. 2007 Annual Compliance Drawing for the Falls City, Texas, Disposal Site

The side slopes are covered with riprap and are in good condition. As noted during previous inspections, minor amounts of fractured riprap were observed along the side slopes. The fractured riprap apparently is an artifact of quarrying and placement of the rock. During the 2007 inspection, no evidence was found to suggest that the riprap is degrading.

A slight slumping of riprap at the toe of the southwest corner of the side slope may be present (PL–4). Although this is likely an artifact of construction, particular attention will be paid to this area during future inspections to determine if any movement is occurring.

An access ramp was installed at the west corner of the side slope in 2006 to facilitate access by maintenance equipment to the top of the cell (PL–5). No changes in the access ramp or side slope were observed.

Small, scattered deep-rooted trees and bushes remain in the riprap on the side slopes of the disposal cell and distribution appears similar to last year. Much of the vegetation seen on the side slopes was either dead or dormant grass. Deep-rooted vegetation is of particular concern because it can penetrate the radon barrier. As in previous inspections, a reference photograph was taken (near perimeter sign P11) of vegetation growth occurring on the southeast side slope (PL–6). Control of undesirable vegetation on the side slopes will be ongoing, including cutting the deep-
5B rooted species and applying a systemic herbicide to the stumps.

The State of Texas collected gamma exposure rate measurements across the cell top and around the site perimeter. None of the measurements caused concerns about protectiveness.

Site Perimeter—The area between the perimeter fence and the toe of the disposal cell is covered
5C with well-established grass. The grass-covered areas between the disposal cell and the property line were cut short to reduce the risk of fire. In order to protect the fence, woody vegetation is controlled from growing along the fence line; vegetation near perimeter signs P6 and P51 will be removed in 2008. Three brush piles were removed on the northwest side of the site, between the disposal cell and the fence line.

No water was observed flowing in the north or south rock drains. Grass growing in both drains (as noted in previous inspections) is not sufficient to impede the flow of water draining from the cell apron. Water was contained within the drains and there was no evidence of large pools of water impounded by grass encroachment. The apron outfall, midway along the northeast side slope, is not yet affected by grass encroachment. Grass in the rock drains may actually assist in dissipating the energy of site runoff, and may, therefore, be a desirable feature. No evidence of erosional problems at the site was noted in 2007.

Outlying Area—The area outward from the disposal site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect site integrity was observed other than the tall grass on the adjacent property, which presents a potential fire hazard. Previously, grazing livestock controlled this growth, but grazing was not evident. Well samplers in a previous trip noted that access to several outlying wells was impeded by overgrowth. Well access routes have been cleared

5.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2007.

5.3.3 Routine Maintenance and Repairs

In 2007, DOE performed the following maintenance at the site:

- Perimeter signs were marked with numbers.
- Cut and treated undesirable vegetation.
- Perimeter fence was repaired.
- Overgrowth of vegetation around outlying wells was cut.

5.3.4 Groundwater Monitoring

5D

There are two components of the groundwater-monitoring program at the Falls City disposal site. DOE monitors groundwater at the site as a best management practice (BMP) to (1) demonstrate the initial performance of the disposal cell (40 CFR 192, Subpart A), and (2) ensure that potential users of groundwater downgradient from the site are not exposed to former processing site-related contamination (40 CFR 192, Subpart B). Because narrative supplemental standards apply to the uppermost aquifer at this site, no concentration limits or point of compliance have been established. Groundwater in the uppermost aquifer beneath the site is designated as limited use (Class III) because it is not currently or potentially a source of drinking water due to widespread ambient contamination that cannot be cleaned up using methods reasonably employed by public water supply systems. Background water quality varies by orders of magnitude in the area because the uppermost aquifer is in an area of naturally occurring redistribution of uranium mineralization. For these reasons groundwater monitoring at the site is considered a BMP.

Two aquifers of interest underlie the site: the shallow Deweesville/Conquista aquifer and the deeper Dilworth aquifer. Because the two aquifers are hydraulically connected, they constitute the uppermost aquifer for regulatory purposes. The Dilworth aquifer is underlain by the Manning Clay, a 300-ft-thick aquitard that isolates the uppermost aquifer from better quality groundwater in deeper aquifers. Groundwater monitoring samples at the site are collected from both the Deweesville/Conquista aquifer and from the underlying Dilworth aquifer.

The disposal cell performance-monitoring network consists of five monitor wells (MW−0709, MW−0858, MW−0880, MW−0906, and MW−0921) that are all completed in the uppermost aquifer and sampled semiannually as specified in the LTSP. Two additional cell performance wells (MW–0908 and MW–0916), also completed in the uppermost aquifer, are designated for water level measurements only.

The groundwater compliance-monitoring network consists of five monitor wells (MW−0862, MW−0886, MW−0891, MW−0924, and MW−0963) that are completed in the uppermost aquifer and sampled annually as specified in the GCAP. The monitor well networks are shown on Figure 5–2.

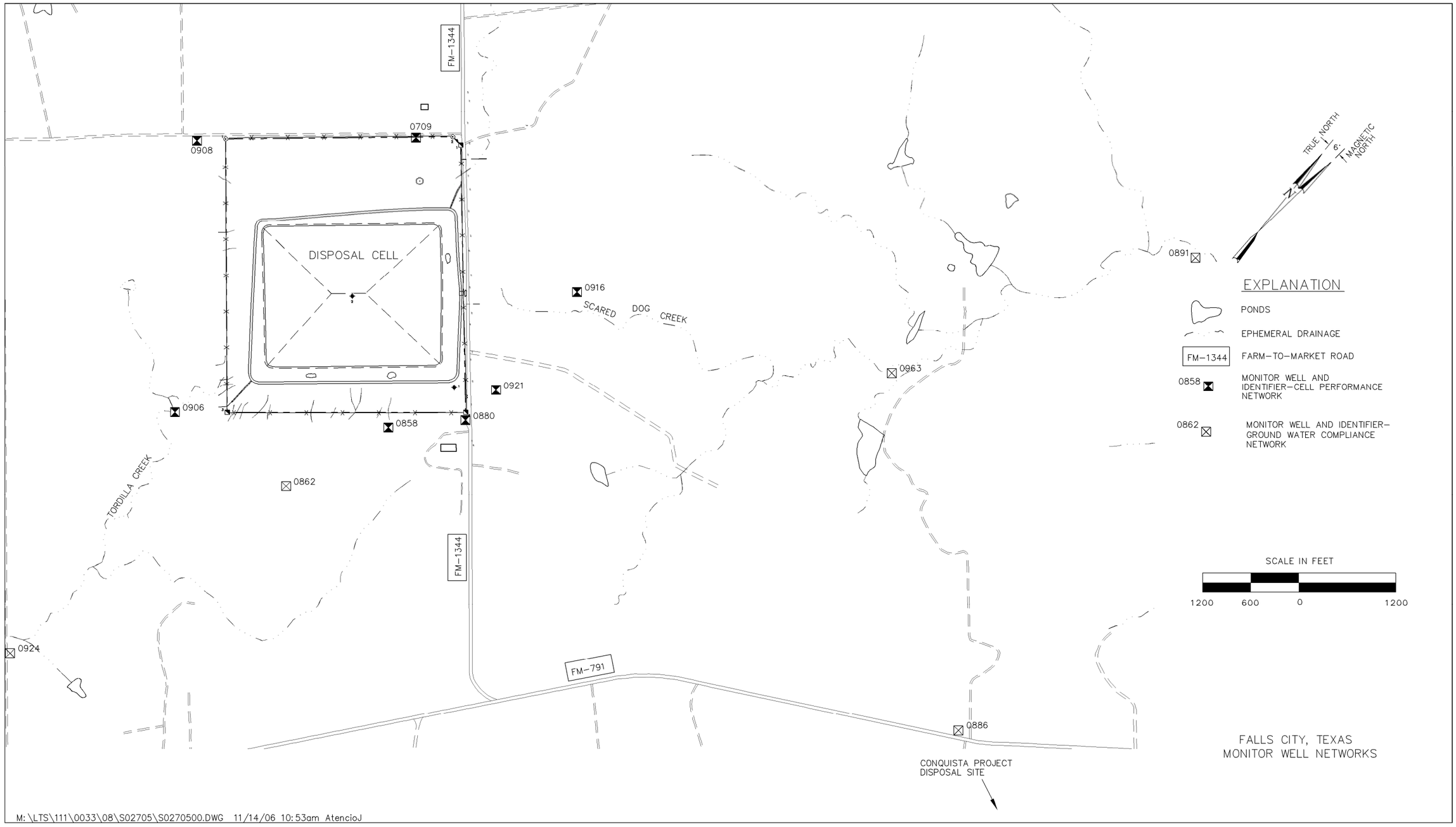

Figure 5–2. Combined Monitor Well Network at the Falls City, Texas, Disposal Site

Groundwater samples from the ten monitor wells are analyzed for 33 constituents, including ten that have maximum concentration limits (MCL) specified in Table 1 to Subpart A of 40 CFR 192. Groundwater level monitoring is performed for all wells in both the disposal cell performance monitoring network and the groundwater compliance-monitoring network.

The LTSP identifies pH levels in groundwater as a sensitive indicator parameter of changes in geochemical conditions because pH exerts a major control of contaminant transport (e.g., contaminant mobility generally increases as pH decreases). Changes in the baseline geochemical conditions may also be indicative of disposal cell performance on the basis of tailings pore-fluid chemistry. Tailings pore fluids were generally lower in pH than background groundwater. However, because pH levels and other signature contaminants in tailings pore fluids are essentially indistinguishable from processing-related contamination, it is difficult to distinguish the possible contribution of contamination from the disposal cell from that which resulted from legacy processing-site activities. Nevertheless, it was anticipated that changes in pH could be used to predict changes in uranium concentrations. Statistical analysis has since indicated only a moderate correlation exists between pH and uranium concentrations in the affected portions of the uppermost aquifer beneath the site. Time-concentration plots for pH and uranium from 1996 through April 2007 are included as Figures 5–3 through 5–6.

Groundwater monitoring results from the October 2006 and the April 2007 sampling events are presented in this report; validated results from the October 2007 sampling were not available to meet the submittal date for this report and will be included in the 2008 report.

Groundwater Quality Monitoring Results—At cell performance wells, pH levels have historically shown consistency (within approximately one standard unit (s.u.) of measurement) since late 1998; no significant upward or downward trends are evident. In 2007, the pH levels for the cell performance wells remain stable and within historical limits (Figure 5–3).

The pH levels for this reporting period for the compliance monitoring wells all are within the historical range (Figure 5–4). Wells MW–0886 and MW–0891 show a slight increase, whereas well MW–0963 shows a slight decrease. Both wells MW–0886 and MW–0891 show a slight upward trend (approximately one s.u. since late 1998). Well MW–0891 was not sampled during the April 2007 monitoring event, but was sampled during the October 2007 monitoring event (unavailable, will be included in the 2008 report).

The uranium concentration in the cell performance network well MW–0880 continues a recent downward trend, since 2003-2004 (Figure 5–5). However, historically, the concentration of uranium in monitor well MW−0880 displays an upward trend. The concentration in this well, which has ranged from 2.74 milligrams per liter (mg/L) to 14 mg/L, is substantially greater than the uranium concentrations reported historically in the other site wells (~1.0 mg/L, or less). Although, the sharp increase and maximum concentration reported in April 2004 (14 mg/L) appears anomalous. The explanation for the higher concentration of uranium in this well in this well is not clear, but may be a result of; (1) transient drainage from the disposal cell, (2) residual processing site-related contamination, or (3) the natural redistribution of uranium mineralization. The cause is ambiguous because tailings pore water is very similar chemically to the processing site-related contamination, groundwater at other monitor wells nearby do not show similarly elevated concentrations of uranium, and pH and water levels continue a slight downward trend in well MW−0880.

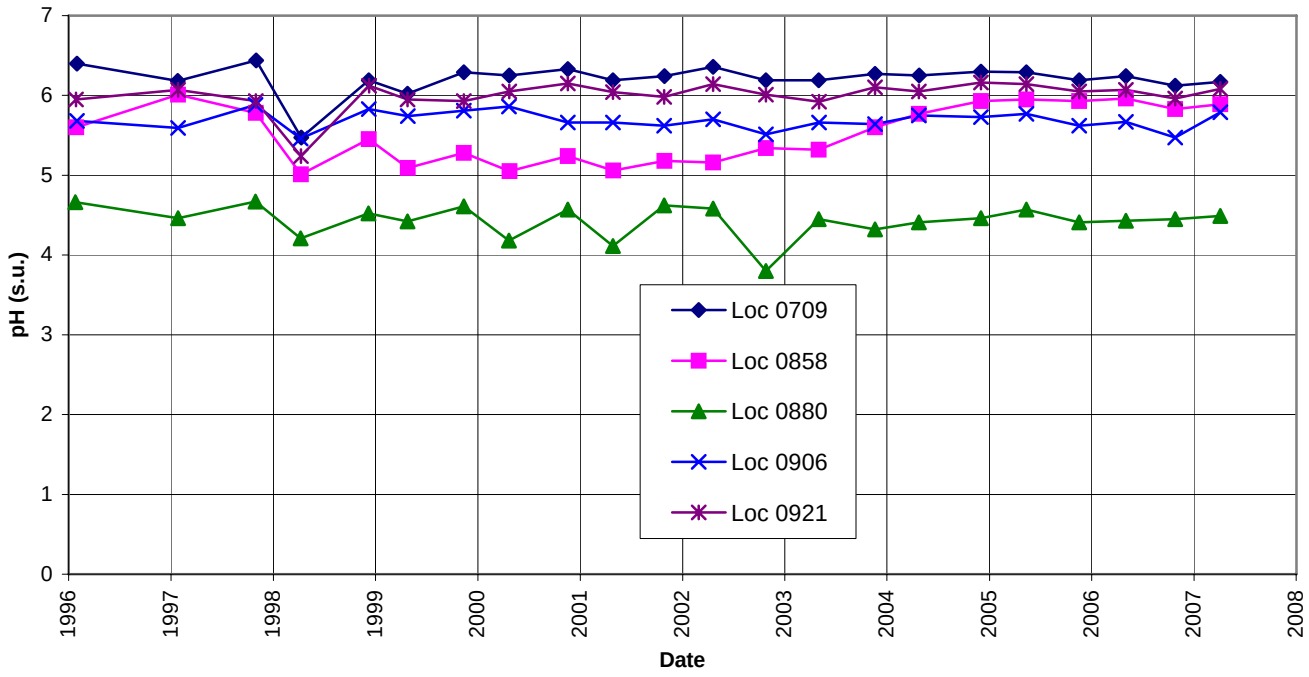

Figure 5–3. pH in Groundwater at Cell Performance Monitoring Locations at the Falls City, Texas, Disposal Site

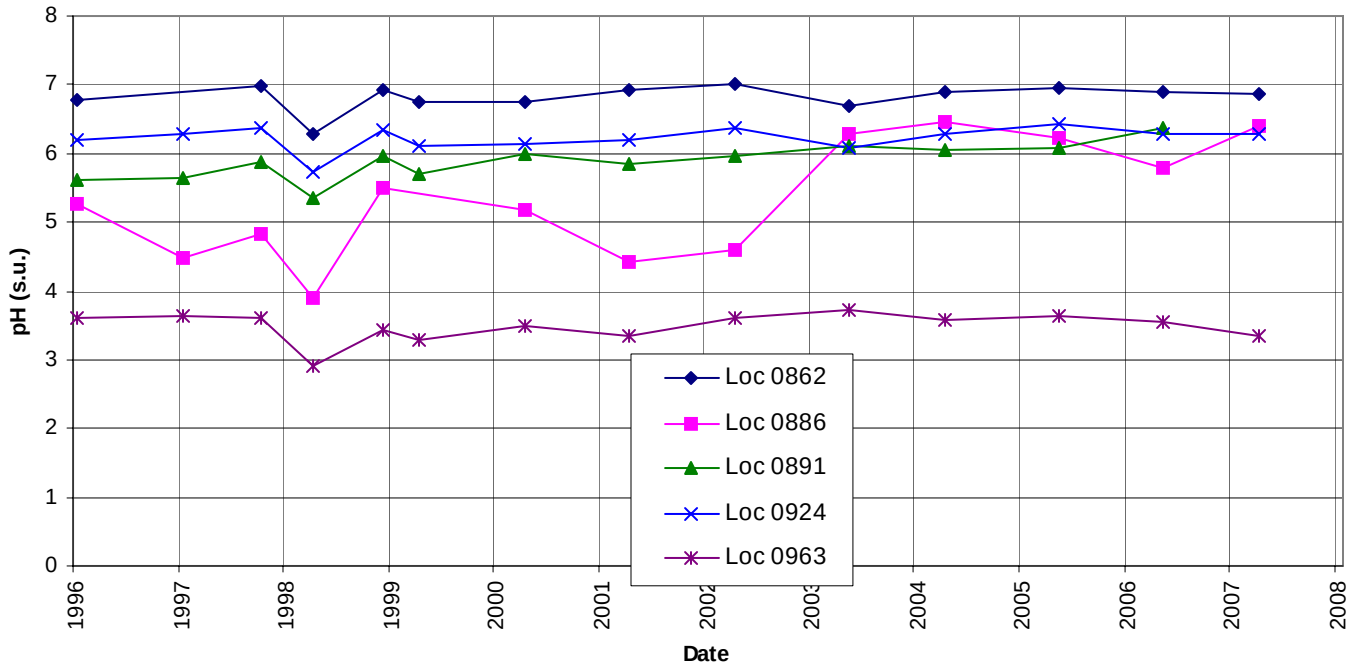

Figure 5–4. pH in Groundwater at Compliance Monitoring Locations at the Falls City, Texas, Disposal Site

The uranium concentrations in the remaining cell performance network wells are as follows: Monitor well MW–0921 continues to display a slight upward trend, reaching a maximum of 1.2 mg/L during the last two reported sampling periods. Concentrations at wells MW–0709, MW–0858, and MW–0906 remain less than 1 mg/L and consistent with historical trends (Figure 5–5).

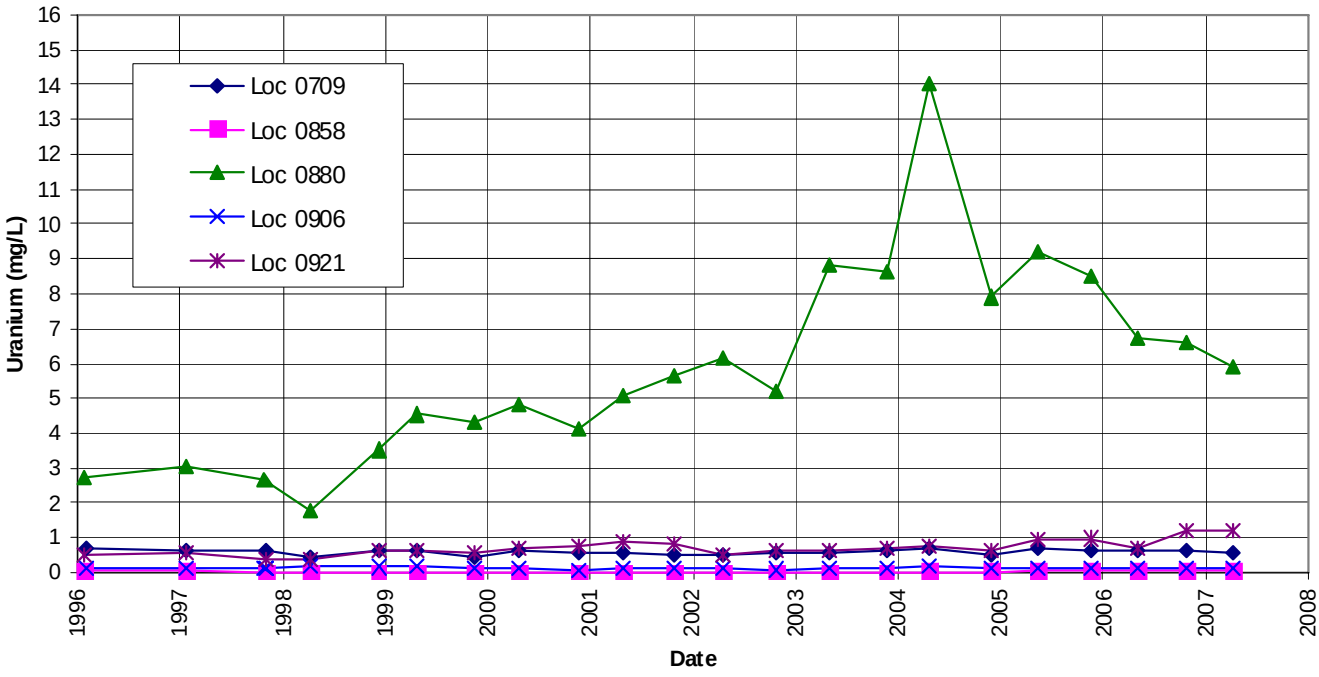

Figure 5–5. Uranium in Groundwater at Cell Performance Monitoring Locations at the Falls City, Texas, Disposal Site

The uranium concentration in groundwater in compliance monitoring network well MW–0924 continues to display an upward trend (Figure 5–6). In April 2007, well MW–0924 reported the highest concentration (0.58 mg/L) historically for any of the compliance monitoring network wells. Monitor well MW–0891 also displays an upward trend; however, no sample was collected from this well in 2007. Uranium concentrations reported in the remaining three compliance monitoring network wells in 2007 were all within the historical range (<0.15 mg/L), with no significant trends evident.

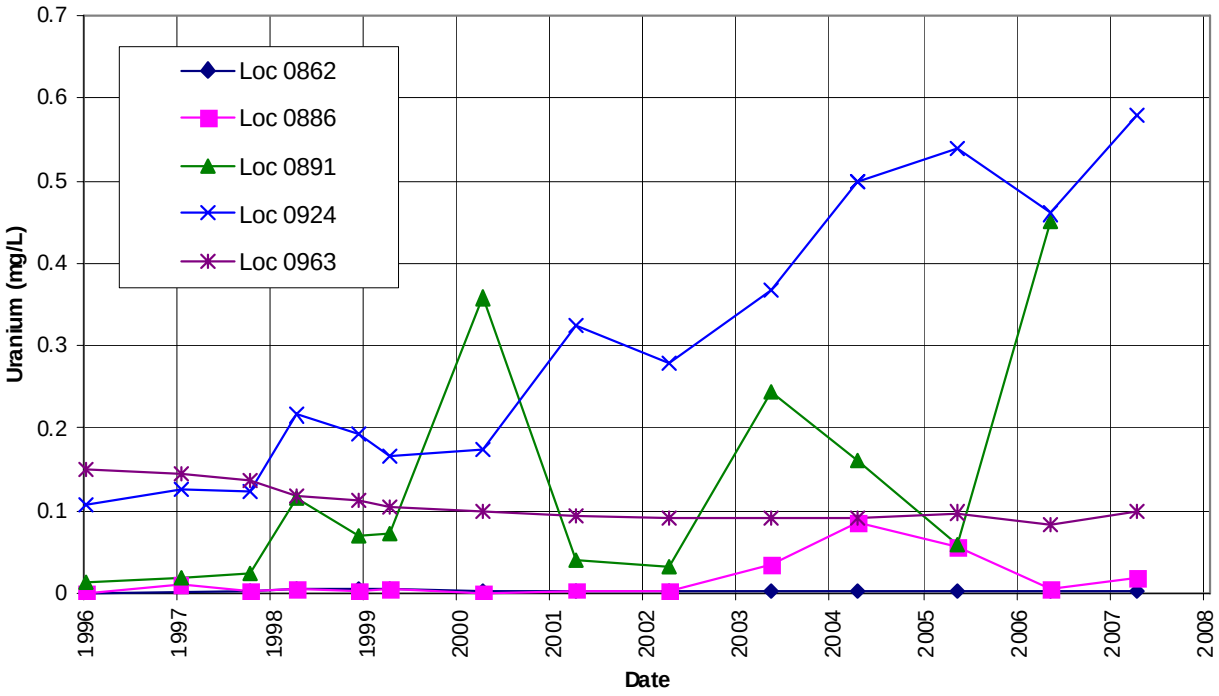

Figure 5–6. Uranium in Groundwater at Compliance Monitoring Locations at the Falls City, Texas, Disposal Site

Groundwater Level Monitoring Results—Groundwater levels in the disposal cell performance network wells initially declined by several feet for the first few years following construction with one exception; monitor well MW–0906 fluctuated up and down several feet before rising and exhibiting an historical upward trend (Figure 5–7). The remaining wells displayed some fluctuations following an initial decline, but historically display a slight downward trend. Monitor well MW–0906 is located directly down slope of the disposal cell, and the historical upward trend is likely the result of percolating water shed by and conveyed away from the disposal cell, with fluctuations reflecting variations in annual precipitation. Other contributors that may influence local groundwater levels include; (1) dissipation of the processing site-related groundwater mound beneath the disposal cell, and (2) dissipation of transient drainage from the disposal cell.

Two cell performance monitor wells, MW–0908 and MW–0916, are not shown on Figure 5–7. These wells, designated for groundwater level monitoring only, are completed in the unsaturated zone of the Conquista Sandstone and have been dry since 1996.

In contrast, water levels in the groundwater compliance-monitoring network wells have all steadily increased several feet since monitoring began in 1996, indicating a regional effect (Figure 5–8). Water levels in 2005 and 2006, in all but one well (MW–0886), also show recent downward levels that likely represent drought conditions that occurred in 2005. In 2007 the water levels in four wells increased again, likely reflecting the wet spring of 2007.

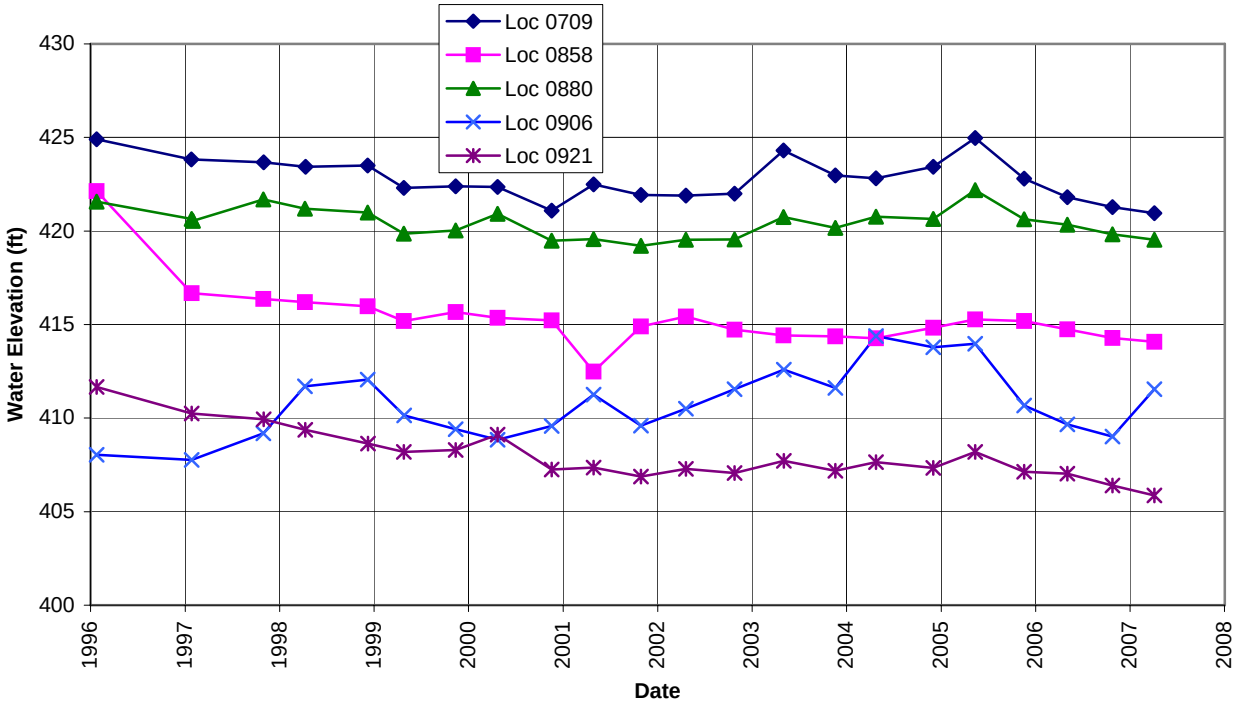

Figure 5–7. Water Level Measurements at Cell Performance Monitoring Locations at the Falls City, Texas, Disposal Site

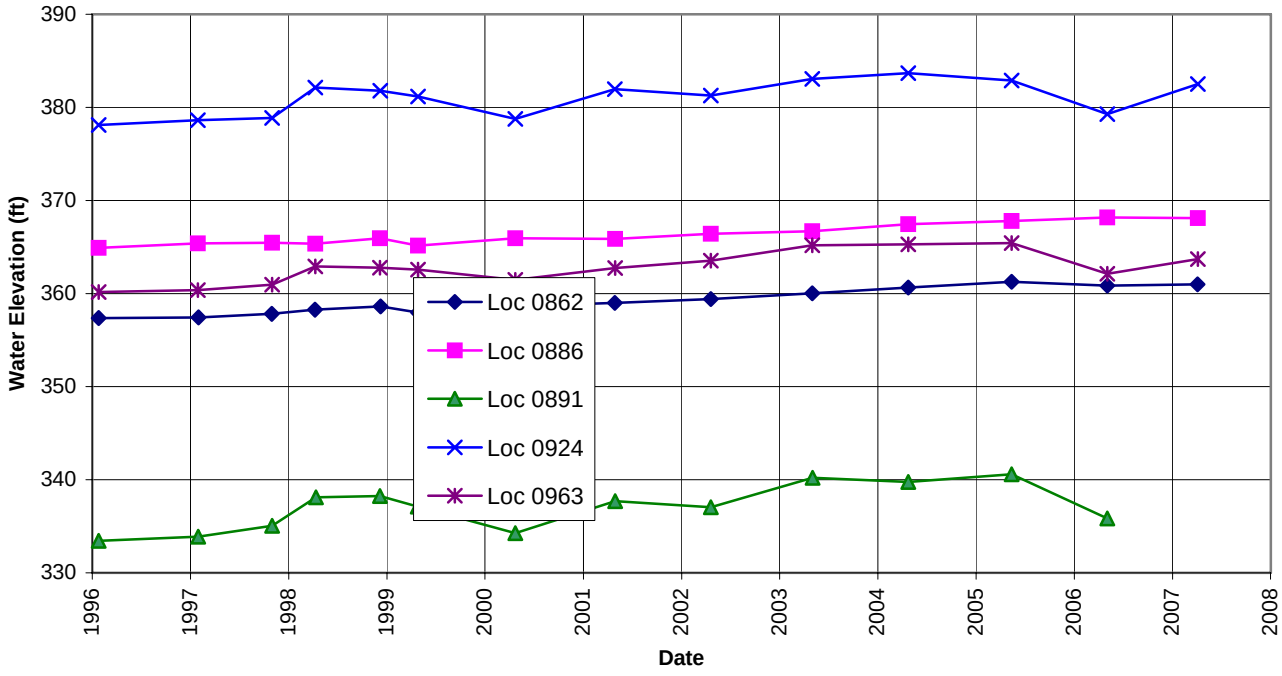

Figure 5–8. Water Level Measurements at Compliance Monitoring Locations at the Falls City, Texas, Disposal Site

Evaluation of Groundwater Monitoring—In 2006, DOE evaluated the groundwater monitoring program at the site, as required every five years by the LTSP, to determine if protectiveness can be demonstrated with reduced monitoring requirements, such as sampling fewer wells, analyzing fewer constituents, and sampling the cell performance wells annually or biennially instead of every six months. 5E

Monitoring for the designated suite of analytes in groundwater does not appear to be an effective means to assess the performance of the disposal cell because the area is affected by widespread ambient contamination (naturally occurring uranium mineralization), uranium exploration and mining, and former uranium-processing activities. Groundwater in the uppermost aquifer at the site is in contact with the naturally occurring uranium deposits and associated minerals. Water that might leach from the disposal cell, either through transient drainage or percolation of precipitation through the cover, will be chemically similar and perhaps indistinguishable from ambient conditions.

Currently, there is no risk from site-related contamination because there is no local use of the groundwater and the groundwater in the uppermost aquifer beneath the site is designated as limited use (Class III). Potable (domestic) water is produced locally from the Carrizo Sandstone that lies 2,000 feet below the surface in the vicinity of the disposal site.

Based on the 2006 evaluation's recommendations, DOE revised the LTSP and on January 24, 2007, submitted it to NRC for concurrence. The revised draft LTSP specifies continued monitoring of the current network of wells annually for the next five years as a best management practice, reducing the analyte list to total uranium, performing field measurements of temperature, pH, conductivity, turbidity, alkalinity, dissolved oxygen, and oxidation-reduction potential, and that monitoring results will be re-evaluated in five years. NRC concurrence with the revised LTSP is pending. 5E

5.3.5 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2007.

5.3.6 Photographs

Table 5–2. Photographs Taken at the Falls City, Texas, Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL–1	135	Vegetation cleared at survey monument SMK–2.
PL–2	250	Mesquite seeding on disposal cell top.
PL–3	270	Hay bales harvested by subcontractor.
PL–4	170	Southwest corner of the disposal cell side slope.
PL–5	255	Access ramp at west corner of the disposal cell side slope.
PL–6	340	Reference photo of side slope vegetation from perimeter sign P11.

FCT 1/2007. PL–1. Vegetation cleared at survey monument SMK–2.

FCT 1/2007. PL–2. Mesquite seeding on disposal cell top.

FCT 1/2007. PL–3. Hay bales harvested by subcontractor.

FCT 1/2007. PL–4. Southwest corner of the disposal cell side slope.

FCT 1/2007. PL–5. Access ramp at west corner of the disposal cell side slope.

FCT 1/2007. PL–6. Reference photo of side slope vegetation from perimeter sign P11.

End of current section.